

REMARKS

In response to the Office Action dated September 24, 2003, Applicants have amended the claims in order to more particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Specifically speaking, the claims now recite that the cap and the vessel are rotated relatively with respect to each other at an elevation where the threads on the cap and the vessel are not engaged with each other. No new matter has been added.

Claims 11, 12, 14, 17, 19, 21 and 22 have been rejected under 35 USC 103(a) as being unpatentable over Yukiari et al in view of Spatz et al. Claims 13, 15, 18 and 20 have been rejected under 35 USC 103(a) as being unpatentable over Yukiari et al and Spatz et al and further in view of Barca. Applicants respectfully traverse these grounds of rejection and urge reconsideration in light of the following comments.

The presently claimed invention is directed to a method of clamping a cap onto a vessel. This method comprises the steps of providing a cap having threads, a vessel having threads with a predetermined winding angle adapted to engage with the threads of the cap, a capping head holding the cap and a motor for rotating the capping head in a clamping direction, rotating the cap and the vessel relatively with respect to each other at an elevation where the threads on the cap and vessel are not engaged with each other, measuring the torque acting on the cap when the distal ends of the threads of the cap and vessel come into contact with each other to detect an incipient position of meshing engagement where the distal ends of both threads contact with each other and rotating the cap in a clamping direction by a predetermined rotational angle with respect to the incipient position of meshing engagement to clamp the cap to the vessel.

The presently claimed invention also is directed to a capping apparatus for clamping a cap onto a vessel. The apparatus comprises a capping head for holding a cap having threads, a motor for rotating the capping head in a clamping

direction so that the cap can be clamped onto a vessel having threads with a predetermined winding angle adapted to engage with the threads of the cap, an elevating mechanism for raising the capping head up and down, measuring means for measuring torque acting on the cap held by the capping head, angle detecting means for detecting an angular position to which the capping head is rotated and control means for rotating the cap and the vessel relatively with respect to each other at an elevation where the threads on the cap and the vessel are not engaged with each other, measuring the torque acting on the cap when the distal ends of the threads of the cap and vessel come into contact with each other to detect an incipient position of meshing engagement where the distal ends of both threads contact with each other and rotating the cap in a clamping direction by a predetermined rotational angle with respect to the incipient position of meshing engagement to clamp the cap to the vessel.

As discussed previously, the present invention requires a cap and a vessel to be capped to be rotated in a relative counter-direction at an elevation where the threads of the cap and threads of the vessel do not engage with each other. An operating force acting on the cap as the distal ends of the threads of the capping vessel first contact with each other is detected so that an incipient position of meshing engagement where the distal ends of both threads first contact each other is determined. The cap is then rotated in a clamping direction by a predetermined angle based on the incipient position of the meshing engagement thereby clamping the cap onto the vessel. The present invention allows for the precise incipient position of meshing engagement of the distal ends of the threads of the cap and the threads of the vessel to be detected independently of the influence of temperature or humidity. This also allows for the cap to be attached to the vessel based on the incipient position of the meshing engagement so that the tightness of the cap can be constant after it is attached to the vessel since the cap is turned

through a given angle of rotation based on the initial contact position of the threads of the cap and the vessel. This allows for the uniform clamping of all caps supplied to the vessel. The prior art cited by the Examiner does not disclose the presently claimed invention.

The Yukiari reference is discussed in the present specification as Japanese Patent Publication No. 86,034/1995 under the heading "Description of the Prior Art". As discussed in the present specification, in the method disclosed in this reference, the incipient position of a meshing engagement between the threads on the vessel and the threads on the cap as detected by initially fitting the cap over the threads on the vessel from above and turning the cap in a direction opposite to the direction in which the vessel is clamped. The distal end of the threads on the cap which is located at the bottom thereof is disengaged from the top end of the threads from the vessel to allow the cap to fall by a vertical distance corresponding to one pitch of the threads on the vessel vertically. The point which the cap reaches upon decent through this distance is detected as the incipient position of meshing engagement between the threads on the vessel and the threads on the cap.

The Yukiari reference is concerned with the prevention of a beret cap. To accomplish this, the lower end of the thread of the cap drops from the upper end of the thread of the container so that the cap is laid over the container horizontally. A position detector 9 detects a hoisting position of the spline shaft 41B at the position where the cap drops down. The cap falls down by a vertical distance corresponding to one pitch of the threads on the vessel vertically. The point at which the cap reaches upon decent through this distance is set as the incipient position of meshing engagement between the threads on the vessel and the threads on the cap. The cap is then rotated by a predetermined angle of rotation from the incipient position of

meshing engagement to complete the capping to make the opening torque constant.

As discussed in the present specification, this prior art method has a problem in that it requires a detecting means for detecting the drop of the cap and, since the turning of the cap in the opposite direction takes place under a clamping condition where the threads on the cap is strongly urged against the threads on the vessel, a likelihood arises that the threads on the cap and/or on the vessel may be damaged. Additionally, there is no disclosure in this reference regarding the rotation of the cap and the vessel relatively with respect to each other at an elevation where the threads on the cap and the vessel are not engaged with each other. In the present invention, the incipient position of meshing engagement can be determined accurately which allows the cap to be turned through a given angle of rotation to achieve a uniform clamping of caps to the vessels. It is respectfully submitted that the prior art cited by the Examiner does not disclose the presently claimed invention.

As discussed previously, the Yukiari reference discloses the prevention of a beret cap by making a capping head drop by a reverse rotation. In this reference, a cap is brought into engagement with a mouth of a container. A controller makes a torque motor rotate in a counterwise direction so that the capping head rises up gradually along slopes of screw parts of the cap and the container. As soon as tip ends of the screw parts of the cap and the container come out of a mutual engagement, the capping head drops down suddenly. The position at which the capping head drops down is determined as a fastening starting position and the rotation is stopped. After that, the controller rotates the capping head in a fastening direction and stops the rotation after rotating a predescribed amount from the fastening starting position. The Yukiari et al reference does not disclose the aspects of the present invention.

The Spatz et al reference discloses a slewing device for screw caps and a method for putting screw caps on containers. The method comprises the steps of placing a screw closure on a container and applying a drive torque to the screw closure to screw it down on the container, sensing an instantaneous drive torque applied to the screw closure, comparing the instantaneous drive torque with a closing torque having a predetermined value and sensing an angle of rotation of the screw closure only upon the instantaneous drive torque reaching the predetermined value of the closing torque.

The Examiner posits that it will be obvious to combine Yukiari with Spatz et al. Applicants respectfully traverse this position. The object of Yukiari is to prevent the generation of a beret cap and therefore has an essential requirement of rotating the cap in a reverse sense while pressing the cap onto a container. In contrast thereto, the Spatz et al reference has no suggestion with respect to providing means for preventing a beret cap. Additionally, Spatz et al has no disclosure with respect to the rotation of the cap and vessel relatively with respect to each other at an elevation where the threads on the cap and the vessel are not engaged with each other. As admitted by the Examiner, neither Yukiari or Spatz et al disclose the rotation of the cap in the clamping direction during its decent or measuring a vertical load acting on the cap. Therefore, it is respectfully submitted that the presently claimed invention clearly is patentably distinguishable over the combination of Yukiari with Spatz et al.

The Barca reference discloses an adaptor system for a capping machine for applying at least one predetermined axial load. However, like the previously discussed references, the Barca reference has no disclosure with respect to the rotation of the cap and vessel relatively with respect to each other at an elevation where the threads on the cap and the vessel are not engaged with each other. Since none of the references cited by the Examiner disclose this aspect of the presently

claimed invention, it is respectfully submitted that the presently claimed invention clearly is patentably distinguishable over the prior art cited by the Examiner.

The Examiner is respectfully requested to reconsider the present application and to pass it to issue.

Respectfully submitted,


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